From Concept To Reality . . .

THE VIRTUAL PROVING GROUND

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Introduction

The Virtual Proving Ground (VPG) is an example of the U.S. Army Developmental Test Command's (DTC's) implementation of Simulation Based Acquisition and Simulation and Modeling for Acquisition, Requirements and Training (SMART) initiatives. The VPG is a multiyear umbrella project to coordinate the acquisition or development of complex synthetic environments, supporting tools, information infrastructure, and the architectural foundation to support the full range of live and simulation-based testing of the Army's weapon systems.

The VPG is now beyond the concept and design stages and is being used more and more to support testing. VPG supports pretest activities, actual testing, and post-test activities. Concurrent with support to ongoing customer tests, VPG is building a general-purpose simulation capability to enhance testing of future systems in a "system-of-systems" environment. The VPG continues to build simulation capabilities for the full range of Army systems in robust, complex synthetic environments representing all conditions in which the Army may operate. The VPG is truly making SMART happen for test and evaluation (T&E).

Overview

As computer modeling and simulation (M&S) increasingly becomes a part of the acquisition process, it presents both an opportunity and a requirement to apply computer-simulation technology to the testing process and to apply disciplined, valid T&E practices in the simulation environment. DTC, the lead tester of Army equipment for nearly 40 years, is continuing development of the VPG to fulfill this requirement. The VPG provides traditional and expanded simulation-based test capabilities in support of streamlined acquisition. It also saves weapons programs significant resources through reduced test-cycle time and cost avoidance associated with test prototypes, retests, ammunition, materials, and labor.

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The VPG consists of comprehensive and interrelated synthetic environments, stimulators, and simulation test procedures operating within a standard architectural framework. The guiding principle of the VPG is to provide the information needed in the most cost-effective manner. In some cases, such as initial operational tests, live assets on real ranges are absolutely necessary; but in other cases, they are not.

Test cost avoidance results when synthetic target environments supplant the need for live targets or ammunition and when synthetic missile-flight environments avoid the need to fire live missiles on a live range. Other cost avoidance results occur when synthetic stimuli accurately simulate the shocks and vibrations experienced in actual operation, when synthetic electromagnetic battlefield environments replace the need for many soldiers to operate radios, and when synthetic test environments are used to plan and rehearse tests to ensure optimized instrumentation placement and operation. In general, M&S significantly reduces program costs and schedule risks and expedites more and better system-performance data because there are fewer hardware prototypes.

Future Of VPG

The VPG is being developed not only to link test centers located across the United States and provide integration between the test centers, but also to establish a large number of reusable test resources that can be

shared among test centers. VPG is using the systems-engineering process to design a fully functional simulation-based test capability. The "blueprint" for developing the VPG is based on five components, which are discussed in the following paragraphs.

The first component, VPG tools, consists of various types of test planning, execution, and analysis tools. These include instrumentation models; test planning and rehearsal; data collection and reduction; test visualization; complex-scenario generation; real-time and non-real-time simulation and analysis; systems engineering; test optimization; multilevel security; and verification, validation, and accreditation support tools.

The second component, integrated information systems, comprises the ground truth data contained at each test center, access to external data sources, and data-serving tools. Data standards are based on an integration-level hierarchy, a set of definition standards that correlate data across the command. Data tools are created that give authorized users a Web-based ability to access, view, and analyze all types of data such as numeric, text, audio, and videos.

The third component, the unit under test, includes models of systems, components, and interfaces to live hardware. Here, the VPG primarily uses models developed by customers and interfaces them to the VPG assets. In some cases, the VPG must maintain weapon system models for "virtual testing" and for use in test planning or analysis. The VPG will provide a detailed interface control document to its customers so they will know how to interface their models with the VPG.

The fourth component on the VPG blueprint is common synthetic environments (SEs), the representations of natural and man-made environmental influences on the unit under test. The representation can be any combination of computer-based simulations or physical stimulators, and the unit under test can be any combination of models, hardware, humans, etc. The acceptable representation level of detail required is dependent upon the specific test objectives and test space. The SE includes the input data description of the environment to be represented.

The Virtual Proving Ground provides traditional and expanded test capabilities in the Modeling and Simulaiton domain to support streamlined acquisition.

The final component of the VPG blueprint is the technical architecture—the mechanism that allows all elements of the VPG to communicate effectively using standard mechanisms. The VPG architecture is based on DOD high level architecture (federation object models, simulation object models, and specific or unique instances of a run-time infrastucture), a VPG collaborative test environment, and architecture implementation tools.

Conclusion

VPG is a re-engineering effort that will help DTC implement innovative, effective, and efficient test processes, procedures, and capabilities to support integrated M&S and T&E across the total life cycle of Army materiel systems. The VPG provides traditional and expanded test capabilities in the M&S domain to support streamlined acquisition. It also saves weapon programs significant costs associated with test prototypes, ammunition, materials, and labor. For additional information, see the VPG Web site at **http://vpg.dtc.army.mil** or e-mail **benchd@dtc.army.mil**.

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